

## Agenda

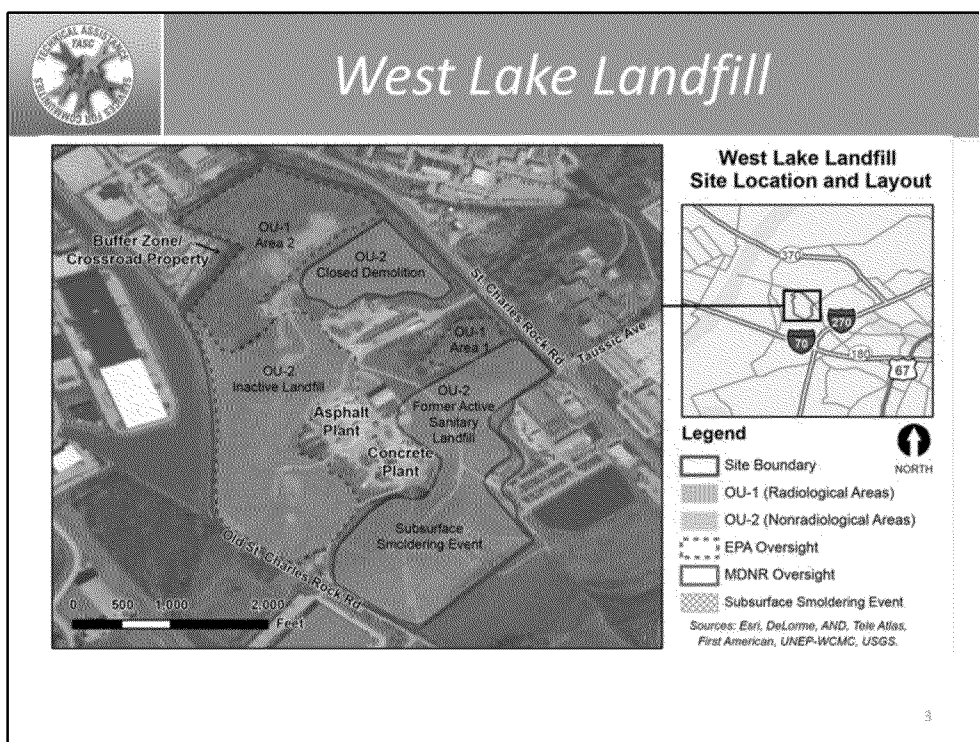
- Introduction
- Report on EPA Activities
- Landfill Caps
  - Bridgeton Landfill Cover
  - Preliminary Cap Design in 2008 West Lake Landfill Record of Decision
  - Weldon Springs Disposal Cell Cap Design

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### Agenda

I was asked by the CAG Technical Committee to speak on the topics listed in this agenda. First, I will give a brief summary of recent EPA activities. This information comes from public documents on the EPA website and from speaking with Brad Vann, the new Remedial Project Manager (RPM) for the West Lake Landfill Superfund site. I don't have complete information about EPA's activities, and I don't represent or speak for EPA.

Second, I will speak about the plastic cover over the Bridgeton Landfill, the landfill cap design in the 2008 Record of Decision (ROD) for West Lake Landfill and the Weldon Springs Disposal Cell Cap Design. Weldon Springs Disposal Cell is a state-of-the-art disposal system for radioactive wastes from the nearby Weldon Spring Uranium Feed Mill Plant, operated by Mallinckrodt Chemical Works of St. Louis. The Uranium Feed Mill Plant produced purified uranium and uranium metal. Radiologically contaminated materials from the dismantled plant were placed in the disposal cell.

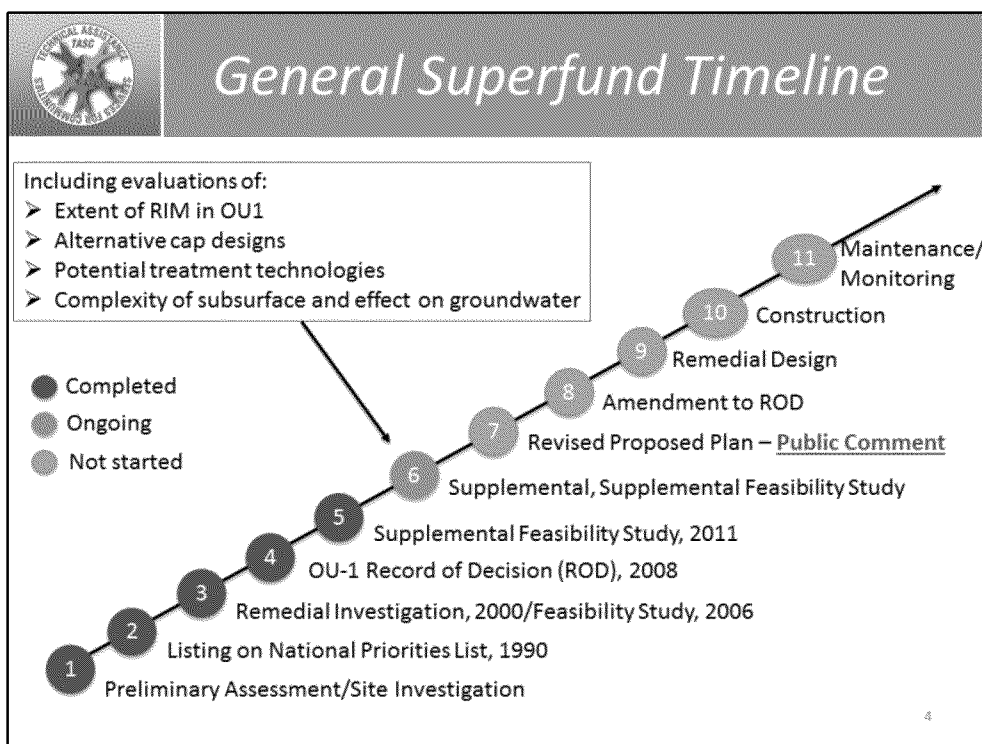


## West Lake Landfill



This diagram of the West Lake Landfill Superfund site is intended for anyone in the audience who is new or needs a refresher of the location of the different areas. The area outlined in red is the whole site. Operable unit 1 (OU-1) includes two areas (Areas 1 and 2) that contain radiologically impacted material, or RIM. OU-1 is being investigated and will be remediated under the authority of the Superfund law by EPA.

OU-2 includes three areas – the closed demolition landfill, the inactive landfill and the former active sanitary landfill (also called the Bridgeton Landfill). EPA has oversight of the inactive landfill. The Missouri Department of Natural Resources has oversight of the closed demolition landfill and the Bridgeton Landfill. The Bridgeton Landfill is experiencing a subsurface smoldering event, or SSE.

The map is dated. It does not accurately show the location of the SSE. When we talk about the 2008 ROD landfill cap design, we will be talking about OU-1.



### General Superfund Timeline

## *Recent EPA Activities*

- USGS groundwater report completed
  - TASC will summarize for next CAG meeting
- Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 Report completed
- EPA off-site air monitoring results reported
  - VOCs and radiation measurements appeared normal for urban environment


## Recent EPA Activities

### Supplemental, Supplemental Feasibility Study

The USGS groundwater report came out in December 2014 and is available on EPA's West Lake Landfill website. TASC has been asked by the Technical Committee to review and summarize this report. We intend to complete this work for the next CAG meeting.


### Thermal Isolation Barrier

- The Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 report is available on EPA's West Lake Landfill website. My next slide discusses actions that EPA has requested of the site's responsible parties (RPs) as a result of the findings reported.
- EPA has also posted two interim reports of their off-site monitoring results for volatile organic compounds (VOCs) and radiation in outdoor air at five locations. These locations are shown on another slide.
  - The off-site air monitoring report for VOCs includes data collected from May to November, 2014. The report for radiation includes data collected from May to December, 2014. The reports state that this air monitoring will provide data for use to (1) evaluate pre-construction concentrations of chemical and radiological parameters of potential concern in outdoor air, and (2) optimize the sampling and monitoring plan for off-site air monitoring to occur during construction of the isolation barrier.



## Recent EPA Activities

- USGS groundwater report completed
  - TASC will summarize for next CAG meeting
- Bridgeton Landfill Thermal Isolation Barrier Investigation Phase 1 Report completed
- EPA off-site air monitoring results reported
  - VOCs and radiation detected at low levels consistent with background concentrations



### Recent EPA Activities (continued)



The interim off-site air monitoring report for VOCs states that, VOC sampling results from the air monitoring stations off site of the WLLS indicated that the VOCs analyzed were variously:

1. Not detected or detected less than 2% of the time (median concentrations much less than the laboratory's detection capability)
2. Detected, but showed no statistical difference from the St. Louis National Air Toxics Trends Station (NATTS) concentrations
3. Detected at concentrations that statistically tended to be higher than those detected at the St. Louis NATTS, but comparable to concentrations detected at other urban area NATTS

Overall, the VOC measurements obtained from the off-site monitoring stations appear typical for outdoor urban environments.

The interim off-site air monitoring report for radiation contains these results:

1. No indication was found that one station had yielded larger or smaller measurements of radioactive particles than any other station.
2. Radon concentrations among the five monitoring stations were similar.
3. Overall, the gamma radiation rate measurements appear typical for an outdoor environment.
  - Month-long environmental dosimetry measurements to supplement the gamma exposure rate measurements appeared normal for outdoor ambient measurements.



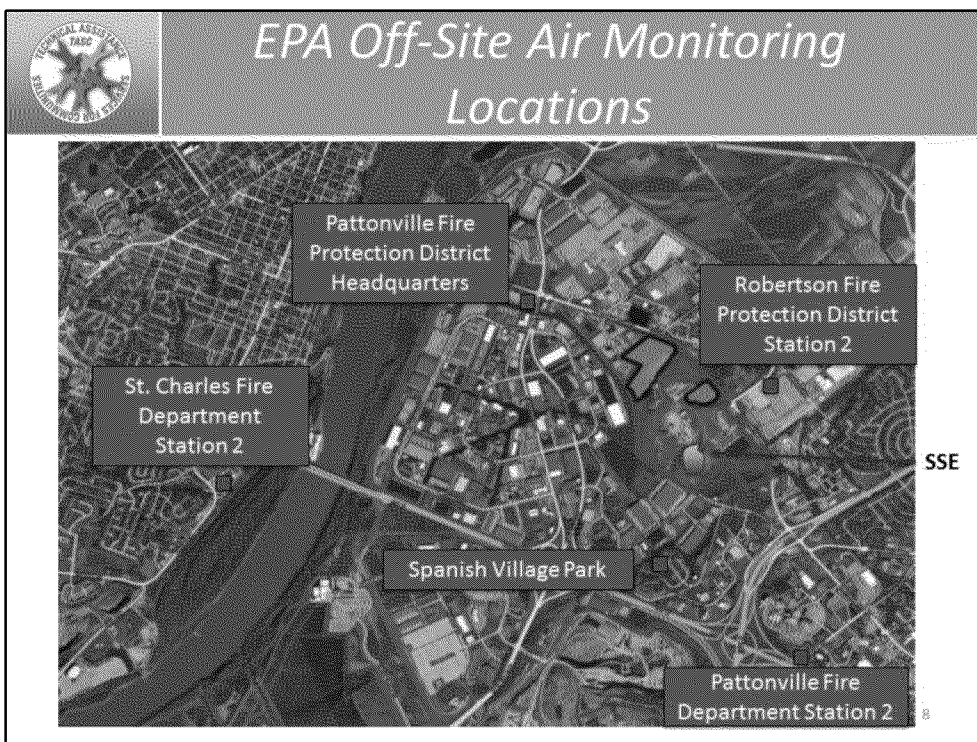
## *EPA Plans*

- RPs to test for RIM south and west of OU-1 Area 1 boundaries
  - RPs to develop sampling plan and work plans
- EPA to test RIM samples with high heat to simulate SSE

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### **EPA Plans**

EPA RPM Brad Vann indicated in a phone conversation that he is working on the plans for additional soil sampling and RIM testing. He will provide additional details at the next CAG meeting.



### **EPA Off-Site Air Monitoring Locations**

This map shows the locations of five air monitoring stations. EPA uses these stations to sample outdoor air in off-site areas surrounding West Lake Landfill. I added the area designating the SSE on this image and the location indicated may not be completely accurate.



## Landfill Covers

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### Landfill Covers



## *Bridgeton Geomembrane Cover*



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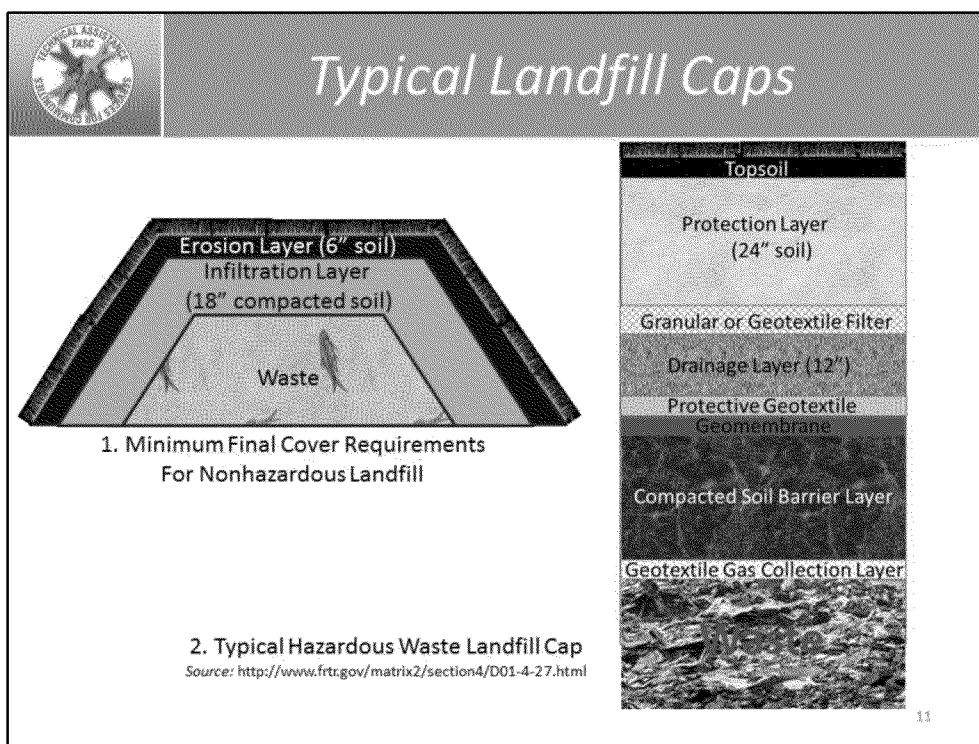
### **Bridgeton Geomembrane Cover**

Bridgeton Landfill is currently owned by Bridgeton Landfill LLC, a subsidiary of Republic Services Inc. The landfill waste mass encompasses about 52 acres, with approximately 240 feet below the ground's surface and a total waste thickness of 320 feet.

The waste is located in two distinct areas known as the North and South Quarries. Bridgeton Landfill was initially permitted on November 18, 1985. It ceased accepting waste on December 31, 2004. A heat-producing reaction deep within the landfill's South Quarry, the subsurface smoldering event, is causing trash to decompose at an accelerated rate. This produces more gas and liquid than normal, and has been the primary source of odor.

According to EPA's Bridgeton Landfill website, all 42 acres of the South Quarry at the Bridgeton Landfill have been covered with a three-layer geomembrane (plastic) liner to capture odor and facilitate landfill gas collection. As shown, the liner has been placed on top of whatever soil/clay covering or cap already existed on the South Quarry.

I don't have specific information about the Bridgeton Landfill cap under the geomembrane shown on this slide. The next slide provides some information about typical nonhazardous and hazardous landfill caps.



## Typical Landfill Caps

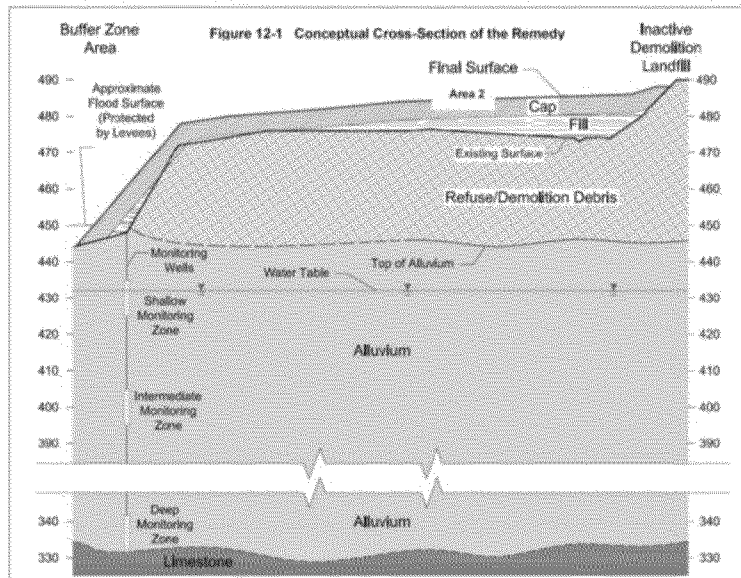
The figures on this slide show:

- 1) Minimum final cover requirements for a nonhazardous landfill. This type of final landfill cover is called a RCRA D landfill cover. RCRA stands for Resource Conservation and Recovery Act (RCRA).
- 2) A typical hazardous waste landfill cover, called a RCRA C landfill cover.

In addition to minimum cover requirements for RCRA D landfills, there are performance-based requirements that determine when the final cover for a landfill is adequate. Final cover requirements are intended to minimize erosion of the cover, prevent rainfall percolation into the covered wastes, and keep landfill gas from building up to unsafe levels or moving underground in a way that could endanger nearby structures.



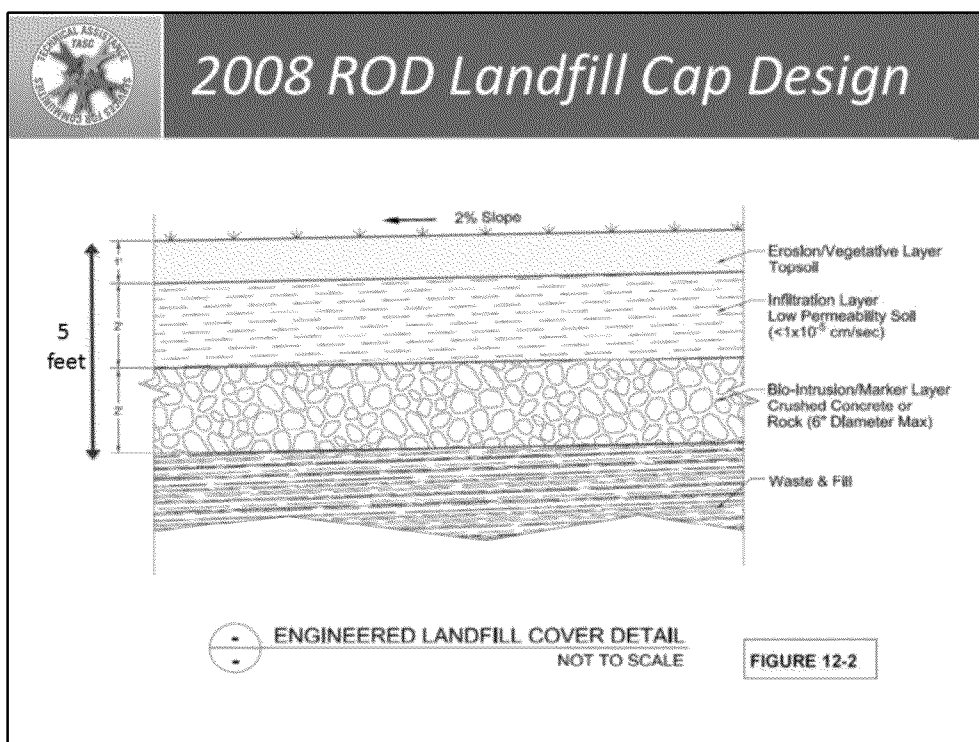
## 2008 WLL ROD Conceptual Design



### 2008 WLL ROD Conceptual Design

This is Figure 12-1 from the West Lake Landfill Superfund site 2008 Record of Decision (ROD). It shows a conceptual design of a landfill cap over Area 2 of OU-1. The cap is about 5 feet deep and consists of layers of rock or crushed concrete and compacted clay soil.

A diagram of the layers of the cap are shown on the next slide. It is important to remember that the information in the ROD is conceptual. If this remedy had been continued into a design phase, more analysis would have followed and more detailed information would be available.



## 2008 ROD Landfill Cap Design

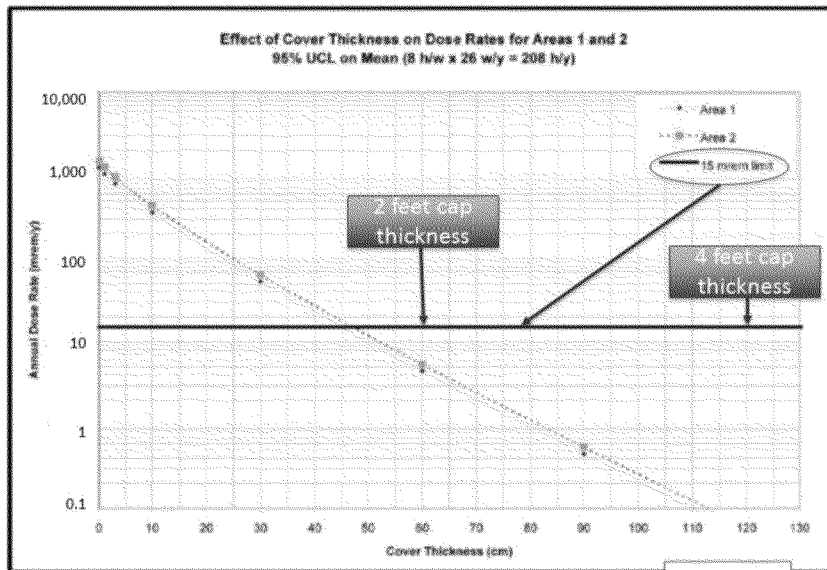
This is Figure 12-2 from the 2008 ROD. It shows that the 5-foot-deep landfill cap would consist of a 2-foot-thick bottom layer of crushed concrete or rocks with a diameter of about 6 inches directly over the waste material. On top of this layer, a 2-foot layer of compacted clay soil would prevent rainwater from percolating down through the landfill. The final top layer of the cap would be 1 foot of topsoil planted with short-rooted vegetation.

This cover is similar to a nonhazardous landfill cover in that the minimum requirement for a RCRA D landfill cap is 2 feet of soil – 18 inches of compacted clay soil to prevent rainwater coming into the landfill and 6 inches of topsoil to establish vegetation. You may wonder why this particular landfill cover design is 5 feet deep.

The 2008 ROD indicates that the purpose of the lowest layer of concrete or rock is to prevent bio-intrusion (plant roots and burrowing animals) and erosion, and to increase the longevity of the cap. Also, the cover thickness of 5 feet is needed to shield a person on the surface from gamma radiation exposure. We'll look at this on the next slide.



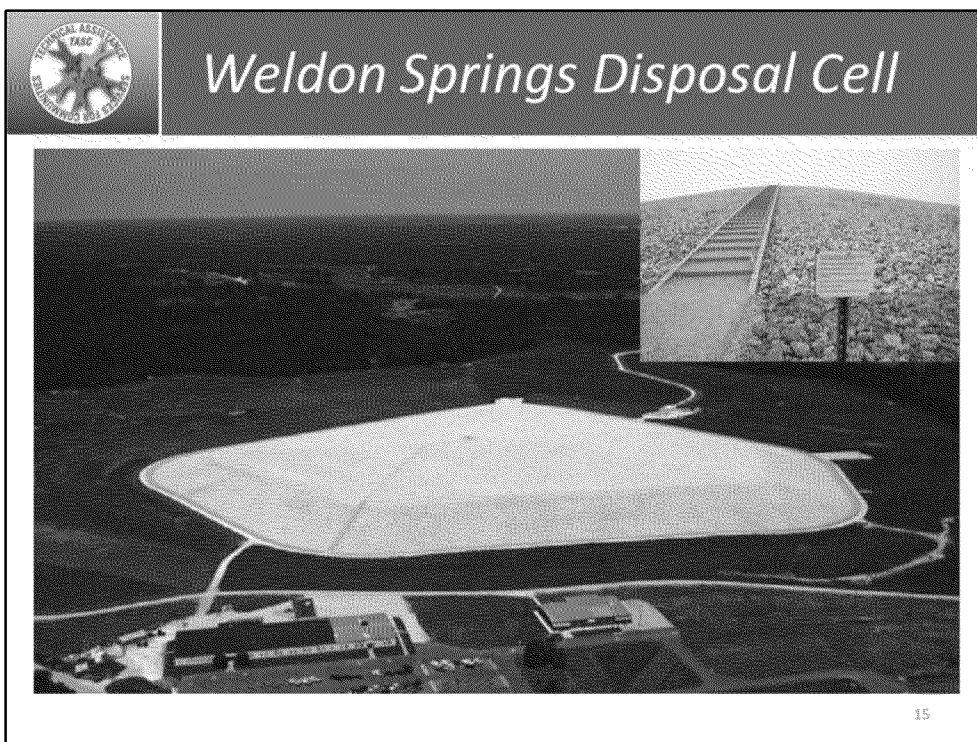
## Radiation and Cap Thickness



### Radiation and Cap Thickness

This is Figure 12-3 from the 2008 ROD. The sloped lines show the dose of radiation a person on the surface of the landfill will receive for different landfill cap thicknesses. The horizontal straight line is 15 millirem per year, which is the dose that EPA guidance indicates is typically considered acceptable for cleanup of Superfund sites.

You can see from the diagram that, at a cap thickness of 5 feet, people on the surface for eight hours per week, 26 weeks per year will be exposed to less than 15 millirem per year of radiation.



## **Weldon Springs Disposal Cell**

The Weldon Springs Disposal Cell was designed to receive radioactive wastes. It has a lined bottom, as well as the cap. It is designed to deter migration of contaminants and remain stable for 1,000 years. The Weldon Springs Site Interpretive Center website highlights these points:

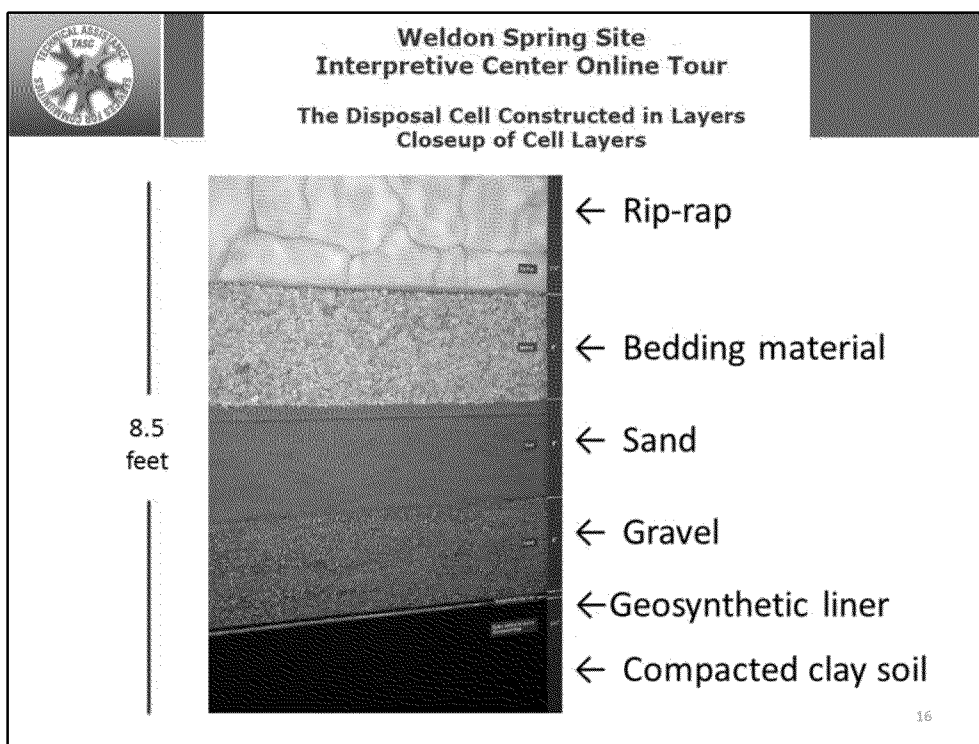
- Engineered to resist long-term erosion and a precipitation event greater than has occurred in the recorded history of the region.
- Designed to withstand a Maximum Credible Earthquake (MCE).
- Located in a geologically stable area; not near earthquake faults.

The gamma radiation from wastes inside the Weldon Springs Disposal Cell may or may not be comparable to the gamma radiation from the RIM at West Lake Landfill.

### **Sources**

Large photo: Department of Energy, [http://www.lm.doe.gov/Weldon/disposal\\_cell.pdf](http://www.lm.doe.gov/Weldon/disposal_cell.pdf)

Small photo: Center for Land Use Interpretation, <http://clui.org/ludb/site/weldon-spring-disposal-cell>



### **Weldon Springs Disposal Cell Constructed Layers**


This slide shows a photograph from the Weldon Springs Site Interpretive Center Online Tour. It is online at [http://www.lm.doe.gov/Weldon/Interpretive\\_Center/Online\\_Tour/Disposal\\_Cell\\_Layers.pdf](http://www.lm.doe.gov/Weldon/Interpretive_Center/Online_Tour/Disposal_Cell_Layers.pdf).

A paper from the Waste Management conference in 2011 provides some details about the disposal cell cap. The cap is approximately 8.5 feet thick. The upper 3+ feet of the top slope consists of limestone riprap with an average diameter of 8 inches. The riprap is 2 feet thick on the side slopes. The riprap layer protects the cover from erosion and restricts penetration of the cover by plant roots and burrowing animals.


This riprap layer overlies a sequence of aggregate bedding and drainage layers. Beneath these layers is a high-density polyethylene (HDPE) liner with an attached thin layer of bentonite (clay). The principal radon/infiltration barrier consists of a 3-foot-thick layer of compacted low-permeability clay soil beneath the HDPE liner.

[Jane Powell, et.al. "Weldon Spring Disposal Cell Performance: The First Ten Years—11333." Waste Management Conference, February 27–March 3, 2011, Phoenix, AZ.]





## Summary



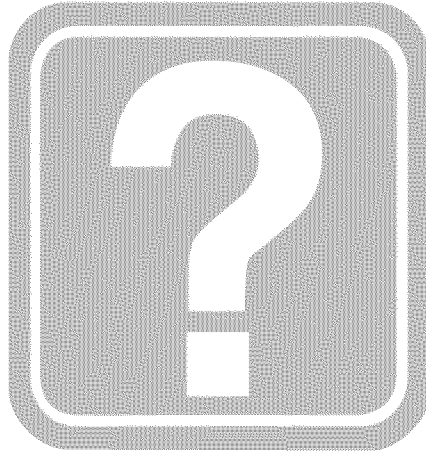
- Geomembrane cover on Bridgeton Landfill is for controlling odor and landfill gas
  - Not a landfill cap
- 2008 ROD landfill cap design is conceptual only
  - A final design could be very different
- Weldon Springs Disposal Cell encapsulates waste that has been moved into a prepared receiving area
  - Includes a cap and bottom liner
  - Not hidden or camouflaged

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## Summary



## *Questions and Next Steps*



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### **Questions and Next Steps**



## CONTACT INFORMATION

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### **Contact Information**